Nov. 18, 1958 J. C. SWATSWORTH 2,860,660

VALVES

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Fig. 1

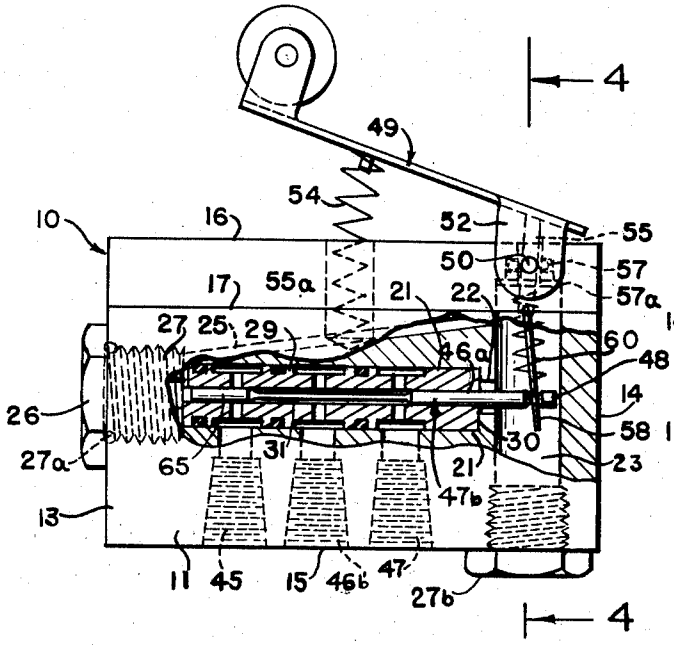


Fig. 2

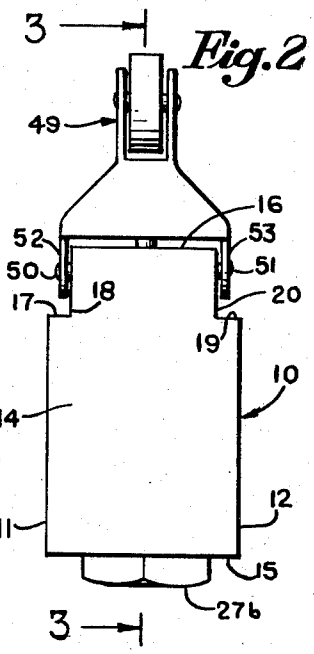


Fig. 3

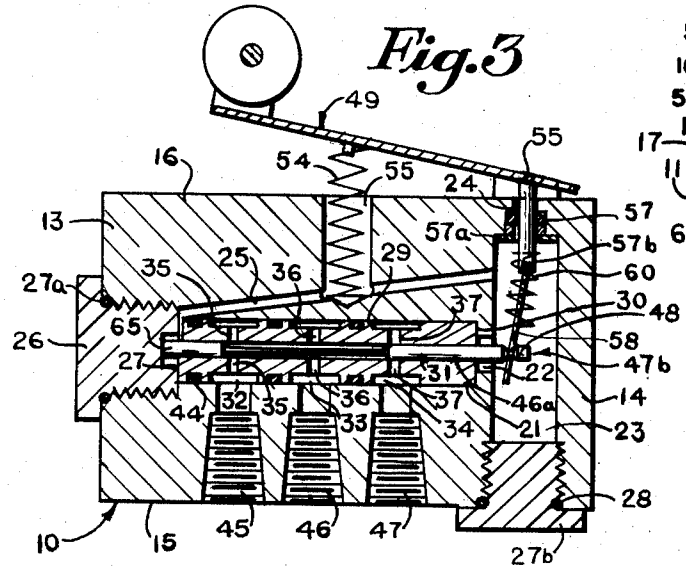
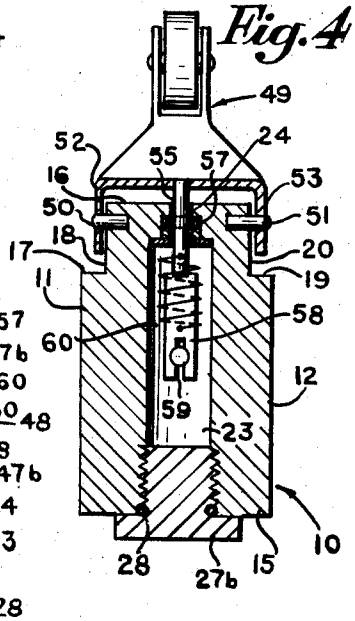


Fig. 4



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VALVES

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6 Claims. (Cl. 137—625.42)

This invention relates to valves for the interconnection of various inlets and outlets.

It is an object of the instant invention to disclose a valve suitable for the interconnection of various inlets and outlets in either an air or hydraulic system.

Another object is to disclose a valve of the type described in which only a light force is required for operation together with the fact that there are no sliding or rotating seals to wear out or cause leakage assuring long life with a minimum of maintenance.

Other objects of the instant invention will become apparent in the course of the following specification.

In the attainment of the aforesaid objectives, subject valve is constituted of a substantially solid body. In the body is a longitudinally directed bore communicating with a transverse bore. Communicating with the longitudinal bore is at least one inlet port and one outlet port. A core with axial bore is removably inserted in the longitudinal bore. Axial openings in the core communicate at one end with the inlet and outlet ports and at the opposite end with the axial bore. Reciprocable in the axial bore is a valve stem having a plurality of spaced lands. Where there are two outlets and one inlet port, either one of the outlet ports can be connected to the inlet port merely by shifting the valve stem, the lands closing one outlet port when the other is open. The inner end of the valve stem is extended into the transverse bore and snap action mechanism in operable engagement with the extended end of the valve stem is provided for the reciprocable movement thereof.

The invention will be more readily understood from the following detailed description taken in conjunction with the accompanying drawings in which a preferred constructional form is shown by way of non-limitative example.

In the drawings:

Figure 1 is an elevational view of the valve in part section with the actuating lever of the valve mechanism in the up position and constructed in accordance with the principles of this invention;

Figure 2 is a right end view of the valve shown in Figure 1;

Figure 3 is a sectional view along the line 3—3 of Figure 2 but with the actuating lever in the down position; and

Figure 4 is a sectional view along 4—4 of Figure 1.

Referring now in greater detail to the drawings where like reference numerals indicate like parts, reference numeral **10** indicates the valve body.

The body **10** is substantially solid, made of any suitable material, and is constituted of the front face **11** in spaced parallel arrangement with the back face **12**, the spaced parallel end faces **13** and **14**, and the bottom face **15** in spaced parallel arrangement with the top face **16**. The top of the body **10** is longitudinally recessed at the front along the vertical line **18** and the horizontal line **17** (Figs. 1, 2, and 4), and at the back along the corresponding

vertical line **20** and horizontal line **19**. Of course, the recessed top is not critical.

Through the end face **13** is a longitudinal bore **21** having a constricted portion **22** at the inner end extremity. Through the bottom member **15** is a transverse bore **23** which is constricted at the top to form a vertical passage **24** through the top face **16**. A passageway **25** interconnects the transverse bore **23** with the outer end of the longitudinal bore **21** (Figs. 1 and 3) for internally balancing the valve and facilitating operation.

The outer end of the longitudinal bore **21** is threaded for the removable insertion of a plug **26** which has an axial recess **27** in the inner end. The plug **26** may be sealed in the body **10** by any suitable means **27***a*. The transverse bore **23** is threaded at the bottom for the removable insertion of another plug **27***b* which may also be sealed in the body by any suitable means **28**.

In the bore **21** is a removable core **29**, the inner end of which abuts a shoulder **30** created by the constricted portion **22** of the longitudinal bore **21**. The opposite end of the core **29** is held against longitudinal movement by the axial recess **27** in the previously mentioned plug **26**. Through the core is an axial bore **31**. Longitudinally spaced along the core is a plurality of circumferential spaced recesses **32**, **33**, and **34** which communicate with the axial bore **31**, through the radial openings **35**, **36**, and **37**, respectively. The core **29** may be sealed in the longitudinal bore **21** by any known packing seals **44**.

Through the bottom face **15** are the spaced ports **45**, **46**, and **47** which may be designed for pipe, tubing, or manifold connection. The ports are so spaced relative to the circumferential recesses **32**, **33**, and **34** that there is communication between the ports and the axial bore **31** through the circumferential recesses **32**, **33**, and **34**.

Reciprocable in the axial bore **31** is the valve stem **47***b* having a land **65** at the outer end and a land **46***a* at the inner end. The lands are so positioned that when the land **46***a* is over the radial opening **37**, the radial openings **35** and **36** are interconnected through the axial bore **31**. The inner end of the valve stem **47***b* is extended into the transverse bore **23** and has formed around the inner extended end a circumferential recess **48**.

Snap action mechanism is used for the reciprocable movement of the valve stem **47***b*, the mechanism being constituted of a lever **49**, one end of which is pivotally secured adjacent the transverse bore **23** by any known pivot means **50** and **51** pivotally attached, for example, through the members **52** and **53** depending from the lever and the vertically directed sides **18** and **20** of the recessed top member **16**. The free end of the lever **49** tends to rotate clockwise under the force of a spiral spring **54**, one end of which is inserted in a recess **55***a* formed in the top member **16** and the opposite end of which is secured in any known manner to the bottom surface of the lever **49** as shown in Figures 1 and 3.

The transverse bore **23** is constricted at the top to form a vertical passage **24**. In the passage **24** is a pin **55** which is rigidly connected at the top by any suitable means to the lever **49**. Any known means **57**, such as ring packing, may be used to seal the pin in the passage. The center of the ring packing is located in alignment with the pivot means **50** and **51** to assure absolute minimum of motion at the point of attachment between pin **55** and the ring packing. A retainer **57***a* maintains the packing in place.

Between the inner end of the pin **55** and the circumferential recess **48** of the valve stem **47***b* is a yoke **58**, having the form of a thin plate. Any known means such as the slot **57***b* in the end of the pin **55** may be used to engage the top of the yoke **58** with the inner end of the pin **55**. In the bottom of the yoke is a slot **59** (Fig. 4) designed to straddle opposite sides of the circumferential

recess 48. Around the slot engaged ends of the pin and yoke is a tension spring 60, the convolutions of which surround the slot engaged ends of the yoke and the pin to give mechanical support to the engagement. Any known means may be used for fastening one end of the spring to the pin above the slot engagement and the opposite end to the yoke.

In operation:

Assume that the port 46 is an inlet and that it is desired to connect the port 46 alternately with the outlet ports 45 and 47. In the down position of the lever 49 as shown in Figure 3 where the land 46*a* closes the radial opening 37, the inlet port 46 will be directly connected through the axial bore 31 with the outlet port 45. By releasing the lever 49, the pin 55 is set into angular motion and moves to align itself with the yoke 58 and spring 60 and continues the movement past center to cause a component of spring force transverse the axis of passage 24 on yoke 58 to move the valve stem 47*b* in the direction opposite to that shown in Figure 3 to the position shown in Figure 1. In the position of Figure 1, the land 65 is over the radial opening 35 and the land 46*a* is moved in the direction of the transverse bore 23 and away from the radial opening 37 so that the inlet port 46 will be connected with the outlet port 47, again through the axial bore 31.

Obviously, the subject valve could be constructed without a core in which case the valve stem could be fitted directly in the valve body having any number of interconnected inlet and outlet ports. Moreover, subject valve can be made substantially small and light in weight. Hence, while there is described and illustrated only one embodiment of the invention, it will be understood that the scope of the invention is not to be limited thereby but is defined by the appended claims.

What is claimed is:

1. A valve comprising a substantially solid body, said body comprising spaced parallel front and back faces, spaced parallel end faces, and a top face in spaced parallel arrangement with a bottom face; said body having formed therein a longitudinal bore extending from one end face toward the opposite end face, said body having formed therein a transverse bore extending from said bottom face toward said top face adjacent the opposite end face and interconnecting the inner end of the longitudinal bore, said body having formed therein a substantially vertical and constricted passage interconnecting the transverse bore at the top, said body further having formed therein a plurality of longitudinally spaced ports interconnecting the longitudinal bore, a core with axial bore removably disposed in the longitudinal bore, means for sealing the core in the longitudinal bore, the core having formed therein a plurality of circumferentially spaced openings interconnecting the ports with the axial bore, a valve stem reciprocable in the axial bore and with the inner end extending into the transverse bore, the inner extended end of the valve stem having a circumferential recess formed thereon, said valve stem further having two spaced lands formed thereon, each land in one position of said valve stem closing at least one port when the remaining ports are open, and snap action means for the reciprocable movement of said valve stem.

2. A valve according to claim 1 in which the snap action means comprises a lever, means for pivotally securing one end of said lever to the top member adjacent the constricted vertical passage, spring tension means for maintaining the free end of said lever under upwardly directed tension, a pin disposed in the constricted vertical passage with one end extending into the transverse bore, a pivot supporting said pin for pivotal movement, means for securing the outer end of said pin to said lever, means sealing the pin in the vertical passage, the axis of said pivot being in substantial alignment with the center of said sealing means, a yoke with one slotted end disposed intermediate the inner end of said pin and the circumferential recess on the extended end of the valve stem, the slotted end being astride the circumferential recess, a spiral spring member disposed around the inner end of said pin and at least a portion of said yoke, and means for securing one end of said spiral spring member to said pin and the opposite end to said yoke.

3. A valve comprising a body, said body having formed therein a plurality of spaced ports, a valve member reciprocable to interconnect the ports, a pin, a yoke having one end swingably connected with one end of said stem and another end swingably connected with said pin, a tension spring between said pin and said yoke, means connected with the pin and external of the body for actuating said pin, a ring packing circumjacently disposed about said pin intermediate its ends, pivot means carrying said ring packing and said pin and having an axis in alinement with said ring packing, whereby a static seal is created at the point of contact of said ring packing with said pin.

4. A valve comprising a substantially solid body, said body comprising spaced parallel front and back faces, spaced parallel end faces, and a top face in spaced parallel arrangement with a bottom face, said body having formed therein a longitudinal bore extending from one end face toward the opposite end face, said body having formed therein a transverse bore extending from said bottom face toward said top face adjacent the opposite end face and interconnecting the inner end of the longitudinal bore, said body having formed therein a substantially vertical and constricted passage interconnecting the transverse bore at the top, said body further having formed therein a plurality of longitudinally spaced ports interconnecting the longitudinal bore, a core with axial bore removably disposed in the longitudinal bore, means for sealing the core in the longitudinal bore, the core having formed therein a plurality of circumferentially spaced openings interconnecting the ports with the axial bore, a valve stem reciprocable in the axial bore and with the inner end extending into the transverse bore, the inner extended end of the valve stem having a circumferential recess formed thereon, said valve stem further having two spaced lands formed thereon, each land in one position of said valve stem closing at least one port when the remaining ports are open, a pin, a yoke having one end swingably connected with one end of said stem and another end swingably connected with said pin, a spring between said pin and said yoke, said pin having a portion located in said transverse bore, a ring packing disposed about said portion of the pin and sealing said pin relatively to said transverse bore, pivot means carrying said ring packing and said pin and centrally aligned therewith, said pivot means being supported in said body, and an actuating lever swingably mounted upon said body and actuating said pin.

5. A valve, comprising a body having at least three spaced ports formed therein, a valve member reciprocable in said body between two positions to alternately communicate one of said ports with two other ports, a pin extending from externally of the body through a body passage and into a body cavity communicating with a connection to the valve member, means establishing a pivot axis for the pin which extends transverse the body passage, a ring packing arranged about the pin at its pivot axis in order to provide a seal structure between the pin and body having no relative movement axially of the pin, a yoke link having the form of a thin plate arranged to be moved from one end by slot engagement with the end of the pin in the body cavity and to operatively engage the valve member with its other end, and a spring coiled about the yoke link and attached to the yoke link and a point on the pin between its slot engagement with the yoke and its transverse pivot axis, whereby pivoting of the pin will cause the spring to establish a force component on the yoke and engaging the valve member in alternate and opposite directions transverse to the axis of the body passage through which the pin extends.

6. A valve, comprising a body having a plurality of spaced ports, a valve member reciprocable in the body between two positions to interconnect the ports, a pin extending through a body passage into a body bore transverse the directions of valve movement and coacting with the valve member, pivot means for the pin establishing a pivot axis transverse and through the body passage, means connected with the pin and external of the body for pivoting the pin about its axis, means operatively connecting the pin end in the bore with the valve member for reciprocating the valve member between its two positions, and a ring packing fixed to the body about the pin and fixed thereto forming a seal between the pin and body in the body passage at the pivot axis, whereby pivoting the pin is accomplished without substantial relative movement between the pin and seal along the longitudinal axis of the pin.

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